MP MASTER
MA33606

SAM I & SAM II

SERVICE MANUAL

M-21

MID STATE COMMUNICATIONS, INC. 174 S. FIRST AVE., BEECH GROVE, IND. 317-787-9426

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SAM I OPERATION

ATTENUATOR

The SAM attenuator is a rotary 70dB attenuator, in 10dB steps. It is cabled to the front panel with double shielded RG-59 and a DC block. The output of the attenuator is cabled to the input of the RF assembly. Should a SAM become unflat this is the first area to suspect.

RF ENCLOSURE

The RF enclosure is a shielded assembly containing the high frequency circuitry associated with SAM's tuning and high I.F. The tunable L.O., which runs approximately from 385MHz to 710MHz, is mixed with the incoming signal in a double balanced mixer to produce the desired 400MHz first I.F. Except for adjusting oscillator range, these two areas of the SAM RF assembly should not be serviced, except by factory trained personnel! The mixer output is amplified through two tuned stages of 400MHz gain, then mixed with a 354.25MHz signal to produce a 45.75MHz output signal from the RF. The 354.25 MHz signal is generated by a 88.5625MHz crystal oscillator which is multiplied through quadrupler and amplifier stages and fed to the second mixer transistor.

A test point for the 354.25MHz signal is provided on the RF enclosure. The level at this point should be +35dBmV to +40dBmV at 354.25MHz. No frequency adjustment is possible. The L.O., quadrupler, and amplifier are all tuned. The L.O. coil should be set 1/2 turn C.W. from peak. The trimers for the quadrupler and amplifiers should be peaked. The 400MHz I.F. amplifiers have three trimers for peaking. This may be done while monitoring the meter indication. The second mixer stage is tuned to the output frequency of 45.75MHz with the coil form slug near the I.F. output. This should be peaked while sweeping the unit in the open loop mode and observing the I.F. response, which should be haystack shaped.

SAM I TUNING

SAM I tuning is accomplished by applying a voltage to varactors in the tunable L.O. The varactor drive circuit is a low output impedance driver circuit. Tuning voltage to this circuit is derived from the tuning board where divider networks set the DC voltage on each end stop of the manual tuning pot. Calibration for each end of each band is provided on the tuning board. A 0 to 12V jack for 0-300MHz tuning for calibrating purposes is also provided. See tuning dial calibration procedure.

SAM II TUNING

SAM II tuning is accomplished by applying a dc voltage to the varactors in the tunable L.O. located in the RF assembly. The varactor drive circuit has low output impedence. Tuning voltage to this circuit is provided from two sources. The first source is a manual tuning divider network consisting of both coarse and fine tuning controls. The second method is much more complex. With the manual/program switch in the program mode, tuning is selected from the keyboard. When a key is depressed the PROM's; which determine the specified frequency, are addressed for that keyboard entry and power is applied to the PROM's for a period of approximately 2.5 ms. During this short period of time the data from the PROM outputs is transfered and stored in the latch circuitry. The output of the latch circuitry then drives a D to A converter that provides approximately the proper voltage necessary to operate the varactor drive circuit. The latch outputs also control a divide by N counter. The input signal to the divide by N counter is from a divide by 256 pre-scaler, mounted in the RF, and coupled to the 400 to 700MHz L.O. The output of the divide by N counter is then fed to a

phase detector, which has a crystal controlled reference. The output voltage from the phase detector is summed with the output voltage from the D to A converter to drive the varactor drive circuit. Thus, a loop is closed. Simply stated, the D to A converter tunes the L.O. near the desired frequency, then the phase detector "hunts" for the proper frequency by producing a small correction voltage until its two input signals are exactly at the same frequency. Note that to change the frequency of any key on the keyboard, the PROM's must be reprogrammed to give the proper D to A output voltage and control the divide by N counter.

Frequency selection is displayed on a liquid crystal display on the SAM II. The same divide by 256 pre-scaler in the RF assembly is shared by the tuning and frequency display sections of the SAM II. The frequency counter section of the SAM II is similar to any other frequency counter in most respects. The only two exceptions are: The ÷ 256 input counter, which requires the use of a 2.56 ms gate time to compensate for the unique input divider; and the "subtraction of 400MHz" before displaying the frequency, since out tunable L.O. runs 400MHz above the desired input frequency. On circuit boards marked part number 080-041 through 080-041c this is accomplish-

ed by simply not connecting the "4" bit from the most significant counter to the display drivers. On boards marked part number 080-41d and up the most significant counter is preset to 12, thus after four counts the display starts at 0 (12 + 4=16 thus setting the binary counter at 0). This method allows the counter circuitry to display both VHF and UHF frequency directly. Previous UHF units displayed UHF channel numbers, using an A to D converter for the counter input instead of the ÷ 256 counter.

IF LOOP

The SAM IF system is a unique, narrow-band, closed loop system. The 45.75MHz input signal is converted in the third mixer to 10.7MHz using a 35.05MHz L.O. and a double balanced mixer. This L.O. uses an FET and can be damaged by static charge. Do not probe in the circuit while power is applied. I.F. bandpass characteristics are set by the ceramic filter, thus the following stages of gain are tuned with the selected standard components. Therefore, no field adjustment should be necessary. The I.F. amplifier circuit contains a MC1350, MC1550, and MC1330. The MC1330 also contains a detector and video amplifier. The video amplifier output is then buffered, level shifted, and supplied to the front panel video output

connector. The 1330 also drives a video amplifier where peak detector error compensation takes place. This circuit then drives the peak detector circuit and provides input signal for the Hum circuit. A comparator circuit, monitors the video detector output, and controls the I.F. gain via the A.G.C. input of the MC1350 stage. Thus, the loop is closed and the signal level at the video amplifier output remains constant over the 40db dynamic range of the I.F. An open loop switch and manual gain pot are provided for open loop operation (i.e. sweeping the I.F., discriminator alignment). The gain control on the 1550 stage is set to optomize meter tracking.

METER CKT

The meter circuit monitors the AGC voltage of the I.F. It is a simple voltage to current converter. This provides the level shifting and control circuitry as well as a low impedence source for the meter amplifier. The main function switch selects the drive circuitry for the meter movement: Voltmeter, Battery Check, SLM Amplifier, Hum Meter Amplifier, and no connection for Spectrum Analyzer. If meter calibration becomes necessary, before following calibration procedure, be sure that front panel controls are in

their proper position; meter gain is locked in the calibrated position, and SLM Calibrator Set Control centered in its range.

AFC.

Automatic frequency control is obtained by applying AFC voltage to the varactor in the 35.05MHz L.O. for the third mixer conversion. The I.F. output from the MC1330 is amplified by a transistor stage and fed to a discriminator. The discriminator then drives a DC amplifier which provides the voltage for the varactor section of the 35.05MHz L.O. Minor discriminator adjustments may be made by peaking the blue coil slug for maximum meter deflection with AFC on.

AUDIO

FM signals are detected by the discriminator and amplified to drive an LM380 audio amplifier circuit which drives a speaker directly.

AM signals are detected by the MC1330 and fed to the SLM video amplifier. This signal is then coupled to the LM380 to provide audio for AM modulated signals.

The audio switch applies battery voltage to the LM380 audio amplifier.

CALIBRATOR

The SAM Calibrator Circuit uses a closed loop

leveling system similar to that used in many fine signal generators. The oscillator output level is monitored by a detector. The detector output is then amplified and monitored by a comparator circuit which controls the bias on the oscillator. Both frequency and amplitude adjustments are provided, but very seldom required.

HUM CKT

To measure hum modulation it is necessary to tune to a C.W. carrier with 0.5% to 5.0% low frequency modulation (HUM). The input attenuator is adjusted so that the signal level is reading in the upper half of the meter scale. This provides a constant amplitude carrier but a modulation amplitude that varies in accordance with the percentage of modulation. When the function switch is changed from SLM to HUM, this signal is fed through three sections of IC (107); a bandpass filter, detector, amplifier, then displayed on the meter. The filter's response is from approximately 50Hz to 400Hz to get good measurement correlation between sine wave and square wave disturbances.

SPECTRUM ANALYZER (RATE GENERATOR)

Two sections of quad IC (110) are used for a

triangular wave generator (4 to 8 V). The varactor drive voltage is derived from IC's (110) & (113) and associated circuitry. Sweep width is proportional to the amplitude of the triangular wave and is controlled by the dispersion control. The center frequency corresponds to the DC level of the triangular wave and is determined by normal tuning methods. The other section of IC (110) amplifies the 4V to 8V triangular wave, and shifts the d.c. level to provide a 0 to 9 V ramp for the horizontal output to the oscilloscope.

POWER SUPPLY--CHARGER

The battery is charged any time the power cord is plugged in. A tungsten filament lamp limits the charge current to the nickel-cadmium battery. An FET connected as a constant current source drives a voltage reference zener diode. This zener provides a stable reference for both the +6 V and +12 V supplies. The +6 supply is an operational amplifier connected as a voltage follower on the reference.

In the +12 V supply an operational amplifier compares the regulated voltage output with the voltage reference to control the conductance of a PNP pass transistor and regulate the output at 12 V. The

configuration of this supply allows regulation even when the battery voltage is as low as 12.3 V.

ALIGNMENT

The first step is to check the oscillator frequency of the third conversion stage. This should be done with a "pick-off loop" and counter. With no signal applied and AFC turned on, adjust the oscillator coil slug labled "AFC on 35.05MHz", then turn AFC off and adjust the control labled "AFC off 35.05MHz" so that the L.O. frequency is still 35.05MHz±10KHz.

Next, tune to a signal with +20dBmV level, the internal calibrator may be used. Be sure that AFC is on and "+10 meter gain" control is in the locked calibrated position. Adjust the "SLM calibrator" control to the center of its range. Adjust the three 400MHz trimmers located on the RF assembly to achieve a peak reading on the meter. Adjust two trimmers in the quadrupler and amplifier stages of the 354.25MHz section for a peak meter reading. Peak the slug in the 88.5625 oscillator coil and then turn 1/2 turn C.W.- note: a C.C.W. turn will disable the oscillator.

The last step in alignment is the AFC circuit. The IF loop must be switched to the open loop position for this procedure. This switch is located on the top

side of the main board near the "open loop gain" control. A sweep generator with a +20dBmV signal must be connected to the SAM input with the attenuator set at +20dBmV center scale. Monitor video out with an oscilloscope and adjust the "open loop gain" control until you have approximately a one volt response. Narrow sweepwidth until the response is approximately two cm. wide. Now monitor "TP.2 AFC" and peak the pink slug in the discriminator for maximum peak-to-peak signal strength. Note this procedure should not be necessary unless repair work on the discriminator circuitry has been necessary.

Next close the loop and return to a C.W. signal source. Peak the meter on the signal with AFC off, then turn AFC on and adjust the blue slug in the discriminator until the meter has the same reading in both AFC on and AFC off. Now the RF output coil slug may be adjusted for a peak meter reading.

This completes all the alignment that should be necessary on any SAM repair.

CALIBRATION

SLM CALIBRATION

1. After alignment procedure proceed to step number two. Tune to a +20dBmV signal, the calibrator may be used. Be sure that AFC is on and the +10

meter gain control is in the locked calibrated position. Adjust the "SLM Calibrator" control to the center of its electrical range.

2. Set attenuator for +20dBmV at center scale.
3. Set "IF gain" for mid range.
4. With an osciloscope monitor the voltage on TP-1.
5. Remove input signal from SAM. The voltage should increase .4 volts. Note that the noise level will change, so average the noise in the response for an accurate measurement. Adjustment may be made at the control marked "loop level".
6. Remove scope probe from TP-1.
7. Set attenuator for +30dBmV center scale and adjust "Low Meter Set" control for +20dBmV meter reading.
8. Set attenuator for +10dBmV center scale and adjust "High Meter Set" control for a +20dBmV meter reading.
9. Set attenuator for +40dBmV center scale and turn "+10 Meter Set" control for +20dBmV reading (+30dBmV by meter markings).
10. Recheck steps seven through nine-there should be almost no interaction between adjustments.
11. If meter tracking is unacceptable, readjust the "IF gain" control. If low-end meter tracking is greater than 10dB, turn gain up. If it is less than 10dB, turn gain down.

SPECTRUM ANALYZER

1. Set up SAM for normal spectrum analyzer operation with a signal generator input.
2. Adjust "analyzer DC level" control so that no clipping takes place at the bottom of the response.
3. Adjust the "analyzer noise set" control so that the display is on the verge of developing scan loss.
4. Set "analyzer DC level" control so that about one-third of the noise is clipped at the bottom of the response.
5. With dispersion set at maximum, manual tuning set at 150MHz, and the signal source set at 300MHz set the "analyzer dispersion" control (on the main board) so that the zero beat and the 300MHz signal are both displayed. Note: some units are servicable well above 300MHz. Therefore, the dispersion may be set to display these frequencies as well.

CALIBRATOR

Recalibration of the calibrator should be necessary only if this circuit requires repair. However, it may be easily calibrated.

1. Using a pre-amplifier and counter, adjust the "calibrator frequency set" slug so the oscillator

frequency is 150MHz.

2. Using a power meter set the signal level output at +20dBmV by adjusting the "calibrator output set" control.

HUM

Hum measurements may be calibrated by using a known standard source with calibrated hum modulation. Adjust the "Hum Calibrator" control for proper calibration-no tracking adjustments are necessary.

VIDEO OUT

The DC level of the video out signal may be adjusted by tuning to a video carrier, with approximately a mid-scale reading. Monitor the video output with an oscilloscope set at approximately 100mV per division and triggered on the vertical sync pulses. Adjust scope gain so that the peak response is exactly eight divisions above ground, then adjust the "video out DC" level control so that the peak-to-peak signal displayed on the scope is seven divisions while maintaining the scope gain such that the peak signal is eight divisions from ground.

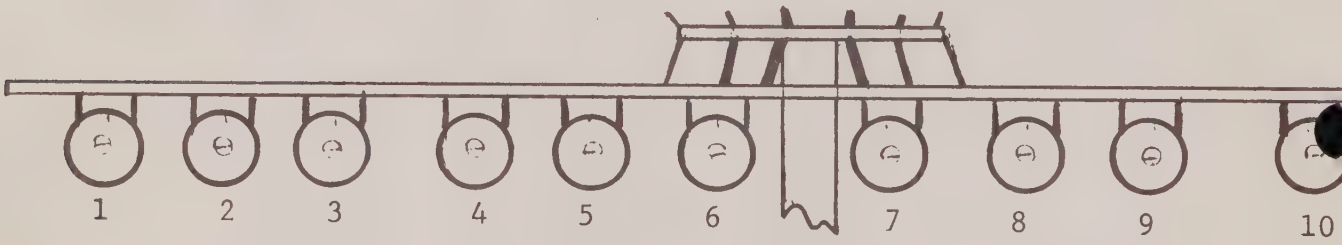
SAM I TUNING DIAL CALIBRATION

Location of Controls:

Looking down into the unit you will see 10 potentiometers. The five on the left are on a higher

level than the five on the right. The higher pots are for setting the high end of the dial. The lower pots are for setting the low end of the dial.

The pots go from left to right in the same order as the bands on the function switch. The first band is the low band. The high end of the low band is then calibrated with the highest pot on the left. The low end of the low band is set with the first low pot on the left. This first low end pot is the sixth pot from the left while the front panel is facing you.



RECOMMENDED FREQUENCIES FOR DIAL CALIBRATION

BAND	LOW MHz	POT #	HIGH MHz	POT #
Low	55.25	6	106.	1
High	175.25	7	215.75	2
Mid	115.	8	165.	3
Super	225.	9	295.	4
Sub	10.	10	45.	5

These frequencies are chosen to make the dial more accurate at normal channel frequencies and to minimize tracking error in the center of the band.

Detailed Procedure:

1. Set-up SAM for the standard test. Set-up on page 1-2 of the operating handbook. Be sure fine tuning is centered.

2. Connect a signal generator to the RF input.

3. Set generator output to +20dBmV.

4. Switch AFC OFF (switch down).

5. Set function switch to low band.

6. Set generator to 55.25MHz.

7. Set dial to 55.25 (channel 2 video).

8. Peak meter with low end dial pot (6th from left on tuning board).

9. Repeat for high end of dial with the frequency from the recommended list.

10. Repeat procedure using the appropriate pot and frequency for all bands.

SAM II TUNING BOARD

SAM II tuning board calibration is obtained by adjusting the DC offset and gain controls in the summation circuitry of the synthesizer, while monitoring the phase detector's output voltage.

1. Connect an oscilloscope to the phase detector test point TP-4.

2. Set oscilloscope vertical to 1V per division and horizontal at 2 ms per division.

3. Check phase detector's output voltage on all keyboard selections, pix and sound, noting the frequency where the highest and lowest readings are obtained. The phase detector's range is optimized when the output voltage is 3V. Normal circuitry non-

linearity will cause the phase detector voltage to change to compensate for linearity changes in the tuning circuitry. Throughout all keyboard selections the phase detector's output voltage should remain between 2V and 4V. If this is not the case proceed to step four.

4. Select the highest frequency on the keyboard that does not meet the phase detector output voltage specification (3V±1V).

5. Adjust the "phase detector offset" control on the SAM II tuning board to bring this selection into specifications.

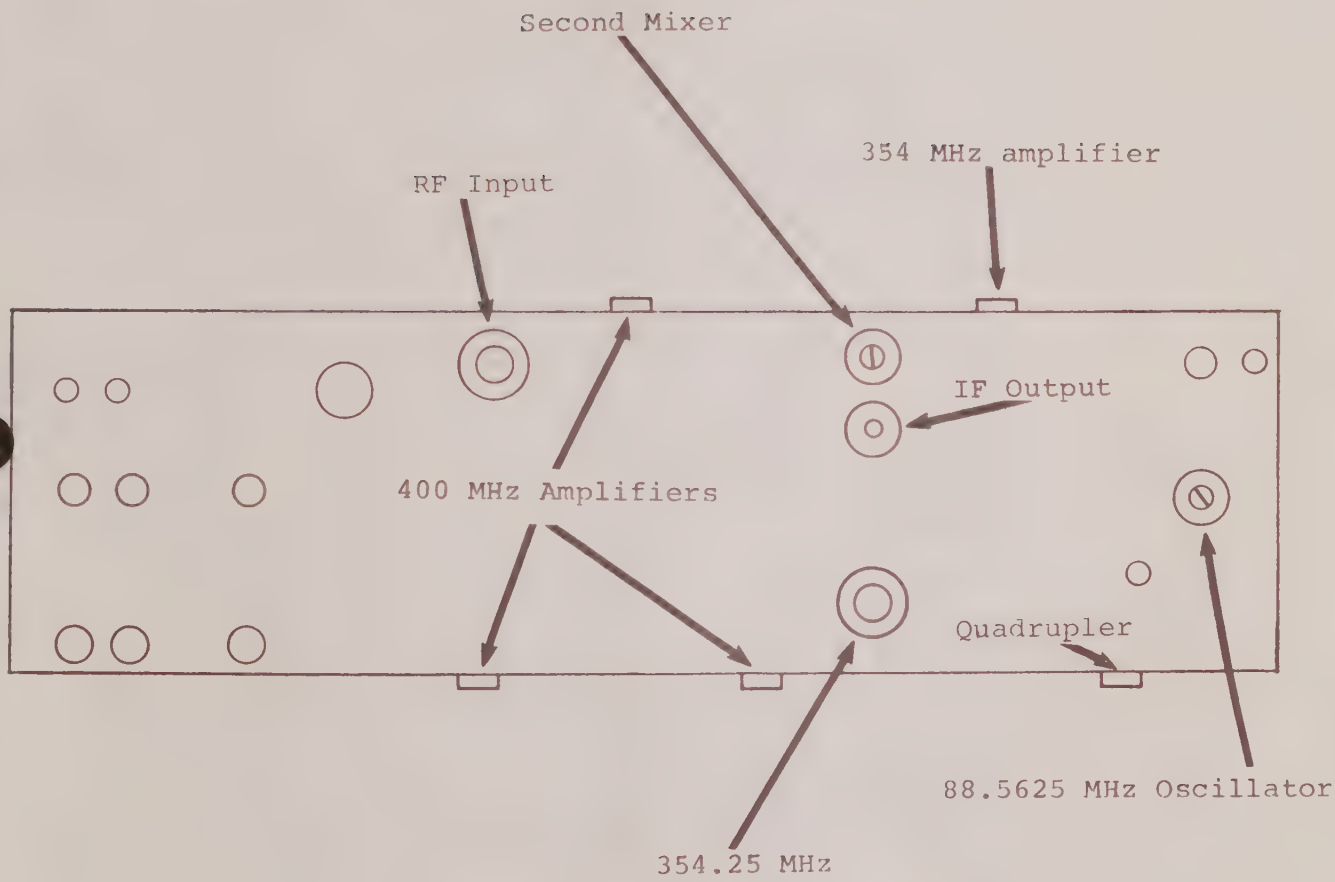
6. Select the lowest frequency on the keyboard that does not meet the specifications.

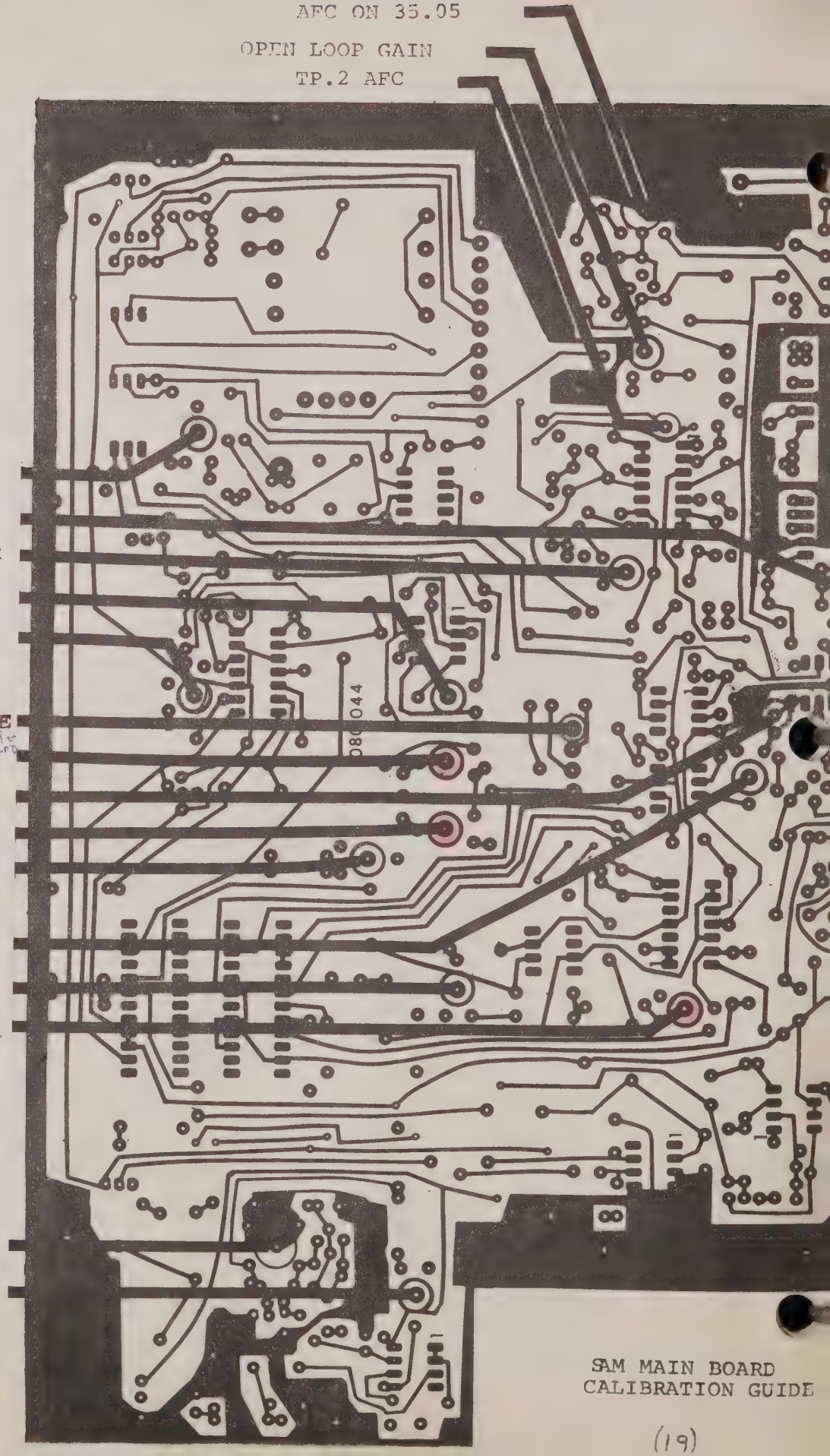
7. Adjust the "phase detector gain" control until the phase detector's output voltage is in specifications.

8. Repeat steps three through seven until all keyboard selections are within specifications.

Note: If only one frequency is out of specification, use the two selections on the keyboard that are the most extreme variations from the 3V optimum phase detector output voltage.

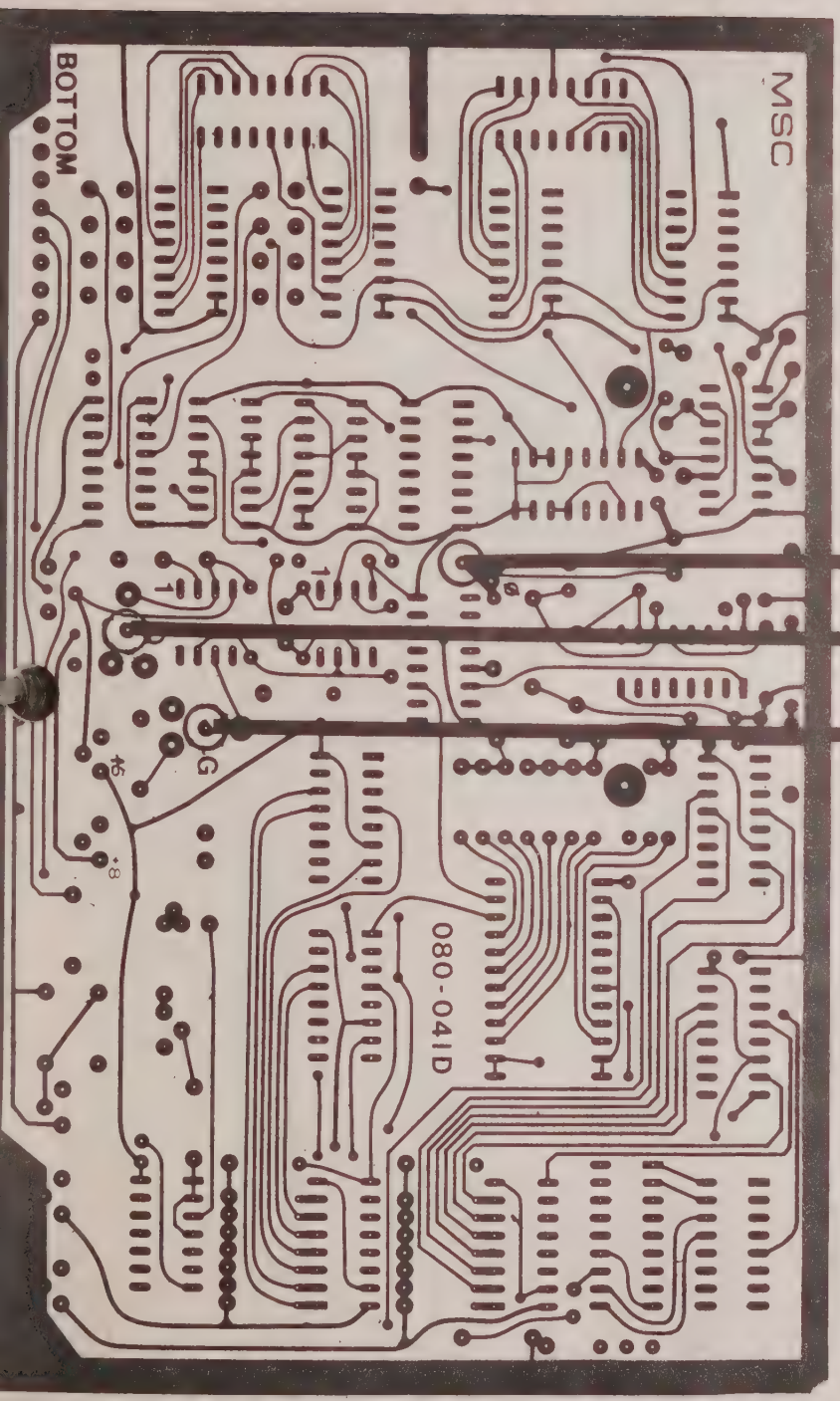
RF ASSEMBLY


Second Mixer
354 MHz amplifier
RF Input
IF Output
400 MHz Amplifiers
Quadrupler
88.5625 MHz Oscillator
354.25 MHz



SAM MAIN BOARD
CALIBRATION GUIDE

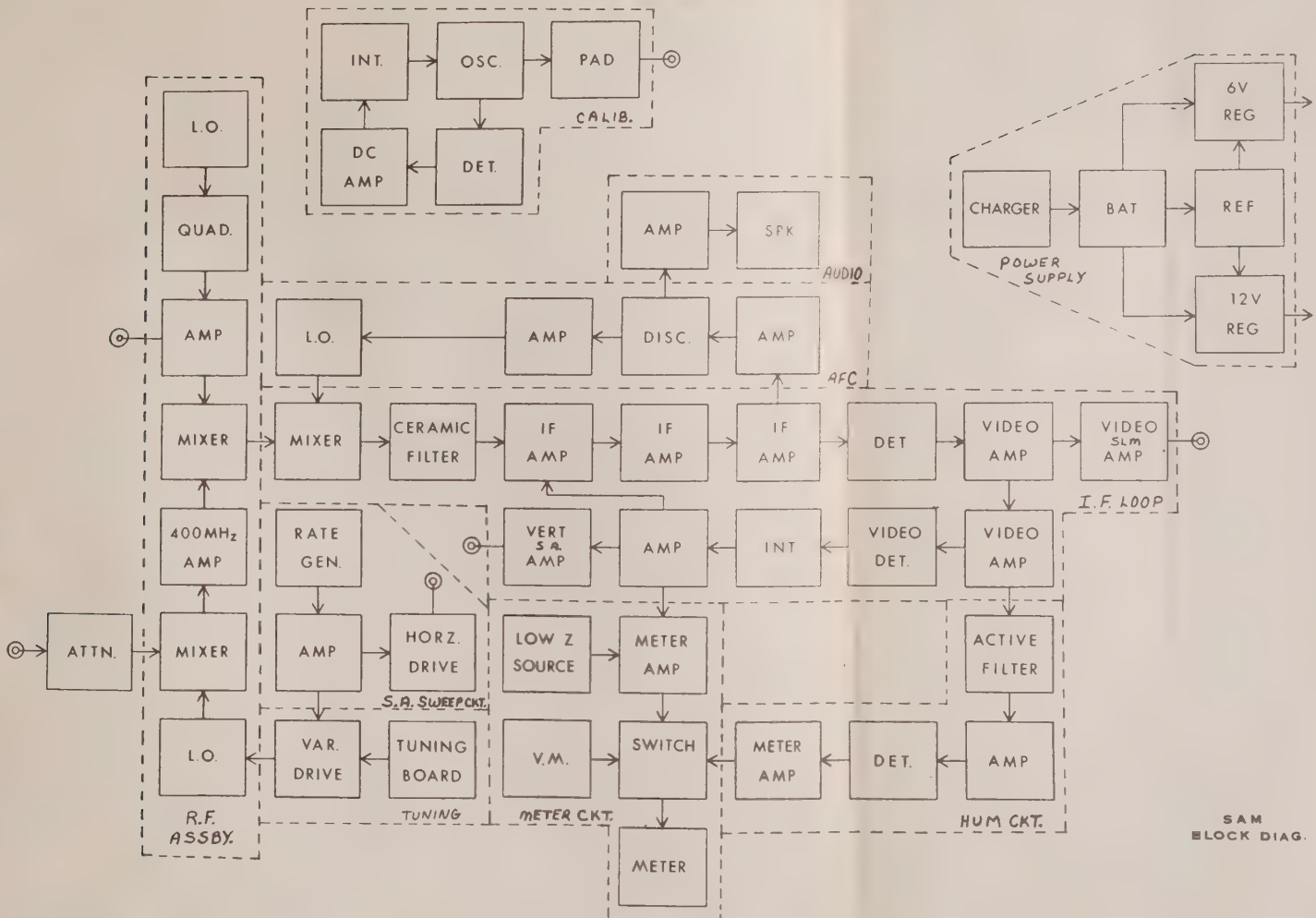
SAM II DIGITAL BOARD

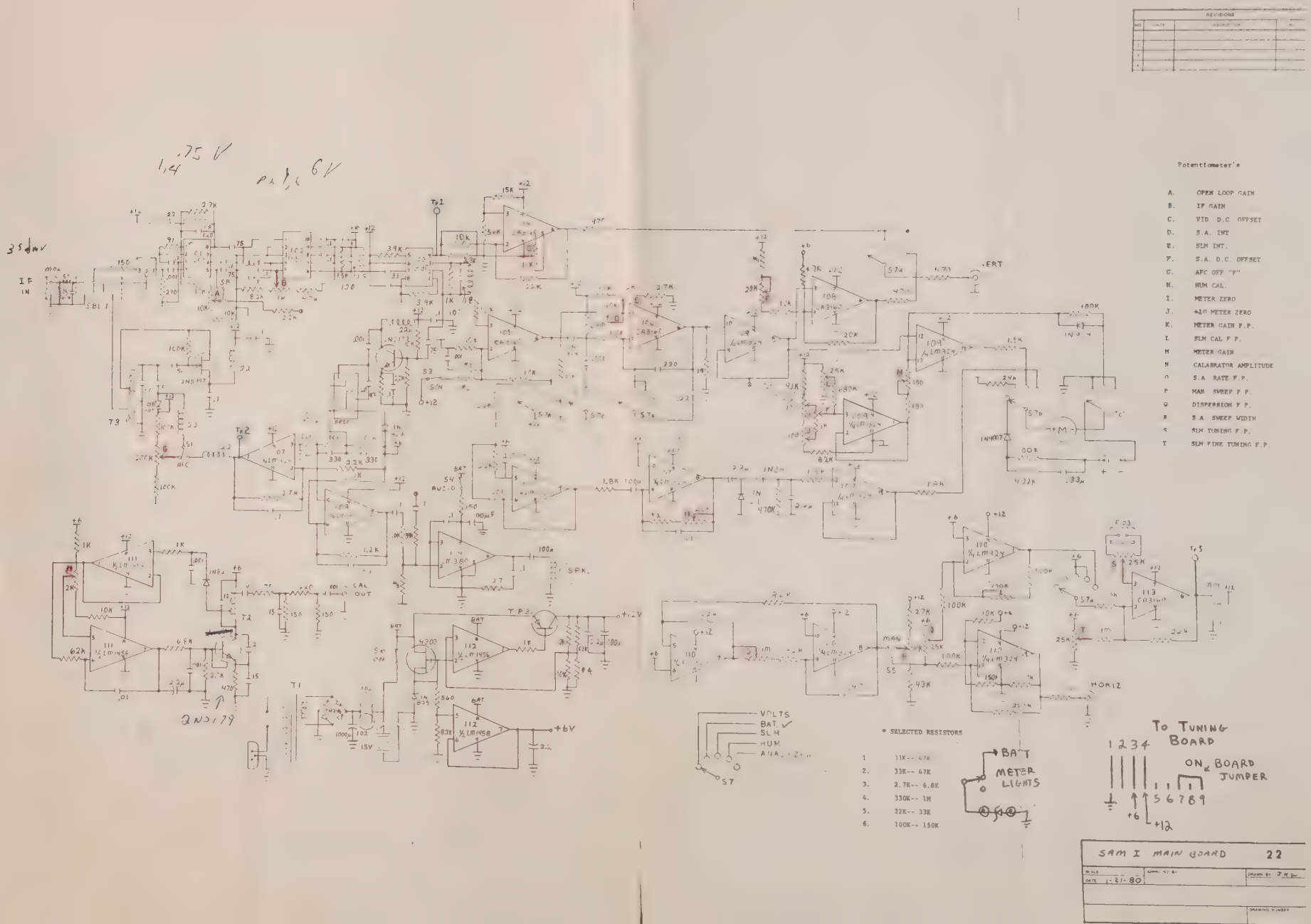


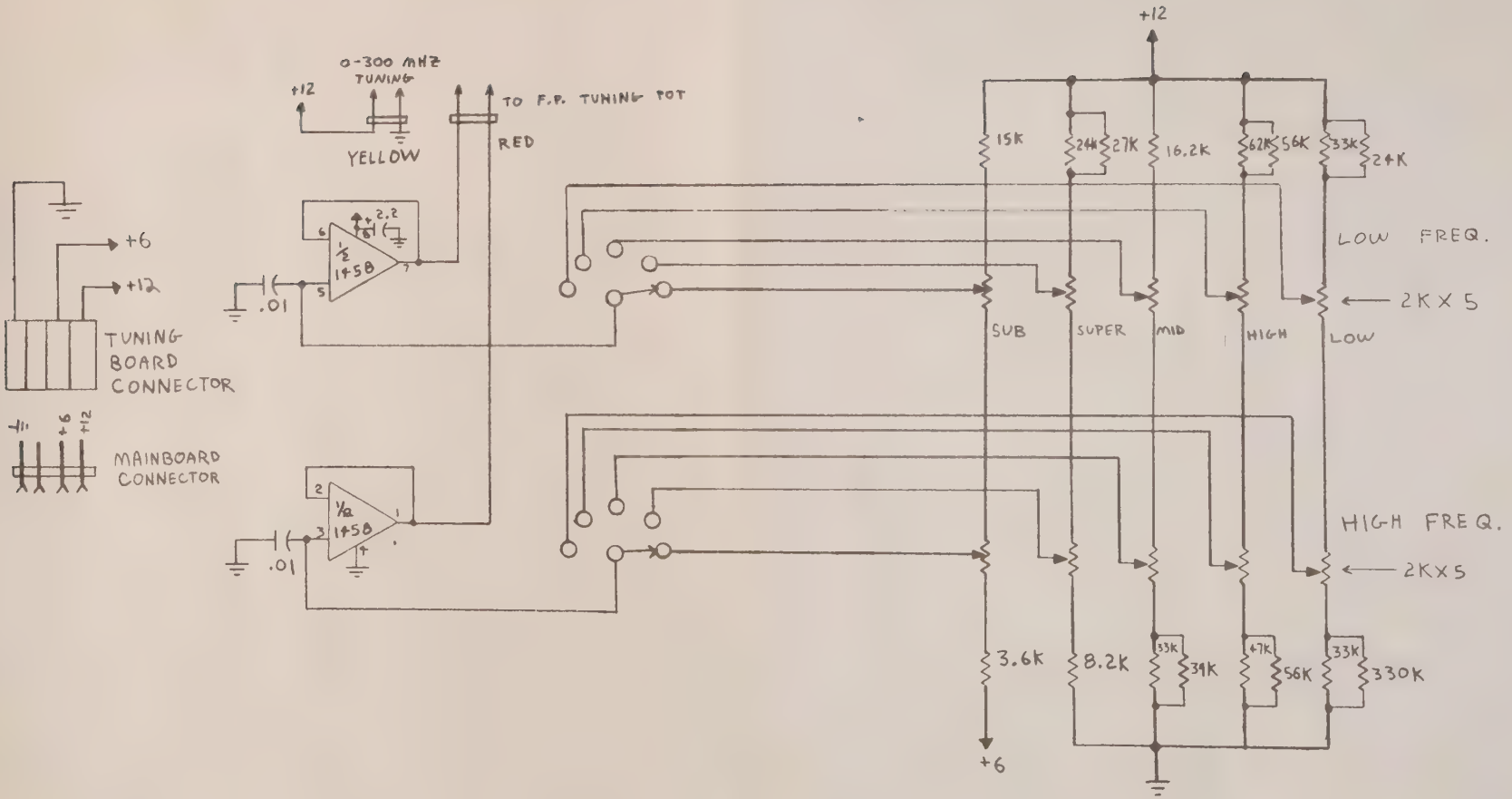
TP.4 PHASE DET.

ø DET. OFF SET

ø DET. GAIN


INT.
OSC.
PAD
CALIB.
DC AMP
DET.
L.O.
QUAD.
AMP
L.O.
AMP
DISC.
AMP
AMP
SPK
AUDIO
AFC
6V REG
CHARGER
BAT
REF
12V REG
POWER SUPPLY
MIXER
MIXER
CERAMIC FILTER
IF AMP
IF AMP
IF AMP
DET
VIDEO AMP
VIDEO SLM AMP
I.F. LOOP
400MHz AMP
RATE GEN.
VERT S.A. AMP
AMP
INT
VIDEO DET.
VIDEO AMP
ATTN.
MIXER
AMP
HORZ. DRIVE
S.A. SWEEP CKT.
LOW Z SOURCE
METER AMP
ACTIVE FILTER
L.O.
VAR. DRIVE
TUNING BOARD
V.M.
SWITCH
METER AMP
DET.
AMP
R.F. ASSBY.
TUNING
METER CKT.
HUM CKT.
METER


REVISIONE
Potentiometer's
A. OPEN LOOP GAIN
B. IF GAIN
C. VID D.C OFFSET
D. S.A. INT
E. SLM INT.
F. S.A. D.C. OFFSET
G. AFC OFF "F"
H. HUM CAL.
I. METER ZERO
J. +10 METER ZERO
K. METER GAIN F.P.
L SLM CAL F P.
M METER GAIN
N CALABRATOR AMPLITUDE
O S.A RATE F.P.
P MAN SWEEP F P.
Q DISPERSION F P.
R S A SWEEP WIDTH
S SLM TUNING F.P.
T SLM FINE TUNING F.P.
IF IN
2N5179
CAL OUT
SPK.
VOLTS
BAT.
SLM
HUM
ANA.
S7
* SELECTED RESISTORS
1. 33K-- 47K
2. 33K-- 47K
3. 2.7K-- 6.8K
4. 330K-- 1M
5. 22K-- 33K
6. 100K-- 150K
BAT
METER LIGHTS
To Tuning Board
1 2 3 4
ON BOARD JUMPER
5 6 7 8 9
+6
+12
SAM I MAIN BOARD
22
DATE 1-21-80
DRAWN BY J.M.L.



TOLERANCES (EXCEPT AS NOTED)	REVISIONS			SAM I TUNING BOARD 23		
DECIMAL ±	NO.	DATE	BY			
FRACTIONAL ±	1					
ANGULAR ±	2					
	3			DRAWN BY	SCALE	MATERIAL
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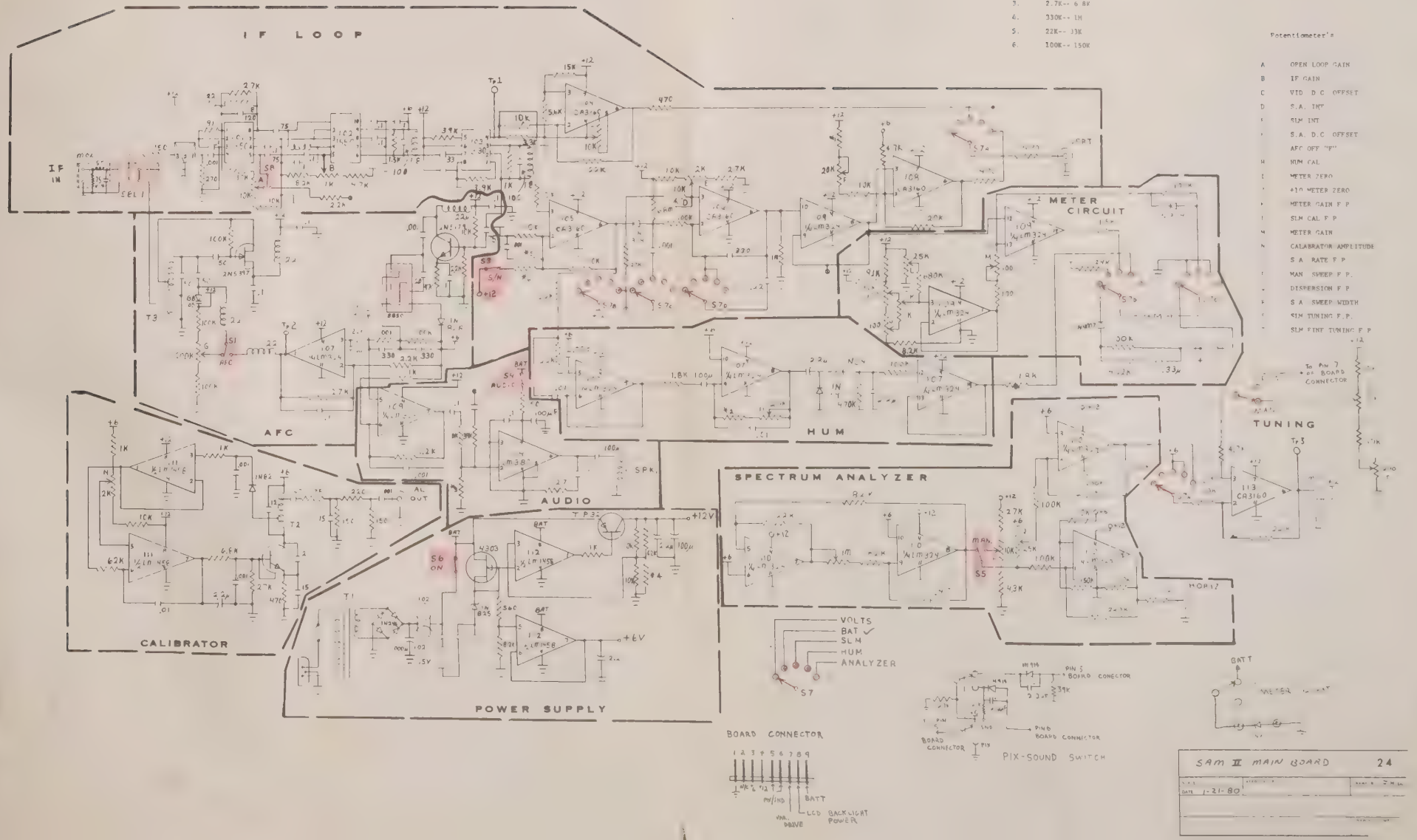
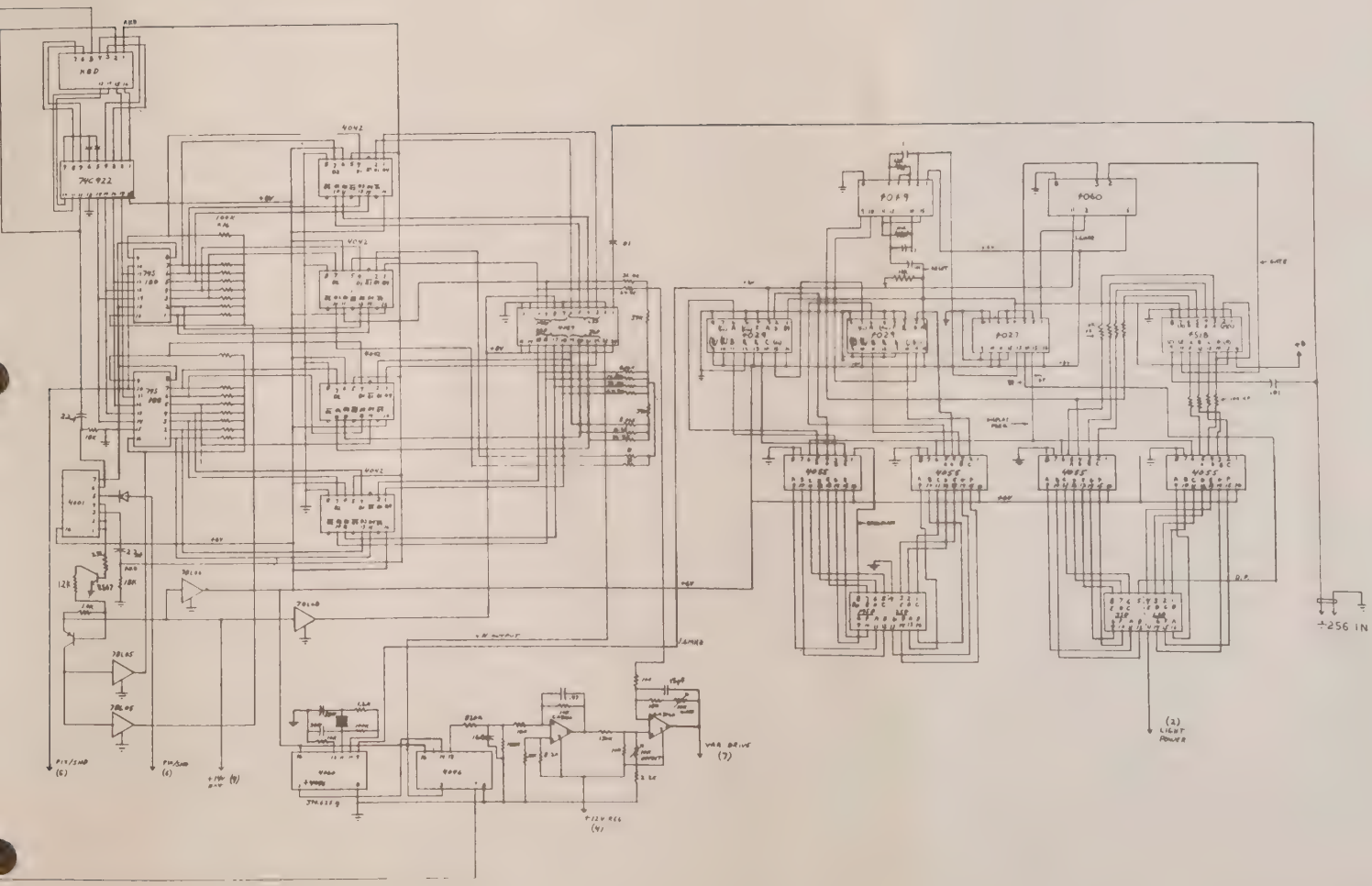

* SELECTED RESISTORS
1. 10K--139
2. 33K--
3. 2.7K-- 6.8K
4. 330K-- 1M
5. 22K-- 33K
6. 100K-- 150K
Potentiometer's
A OPEN LOOP GAIN
B IF GAIN
C VID D.C OFFSET
D S.A. INT
E SLM INT
F S.A. D.C OFFSET
AFC OFF "F"
H HUM CAL
I METER ZERO
J +10 METER ZERO
K METER GAIN F P
L SLM CAL F P
M METER GAIN
N CALABRATOR AMPLITUDE
S A RATE F P
MAN SWEEP F P.
DISPERSION F P
S A SWEEP WIDTH
SLM TUNING F.P.
SLM FINE TUNING F P
IF LOOP
IF IN
METER CIRCUIT
AFC
HUM
TUNING
SPECTRUM ANALYZER
AUDIO
SPK.
CALIBRATOR
POWER SUPPLY
VOLTS
BAT
SLM
HUM
ANALYZER
BOARD CONNECTOR
PIX-SOUND SWITCH
SAM II MAIN BOARD 24
DATE 1-21-80


74C922
4042
4001
4066
4081
4049
4050
4069
4011
4023
4030
4001
4011
4023
4030
4069
4081
4049
4050
4042
4066

TESTING AND OPERATION HANDBOOK

SAM I & SAM II

Small Manuals
M-1

M
S
C
COMMUNICATIONS, INC. 174 S. FIRST AVE., BEECH GROVE, IND. 317-787-9426

U.S. CABLE CHANNEL FREQUENCIES

CHANNEL	VIDEO CARRIER	SOUND CARRIER
T- 7	7	11.5
T- 8	13	17.5
T- 9	19	23.5
T-10	25	29.5
T-11	31	35.5
T-12	37	41.5
T-13	43	47.5
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
A-2	109.25	113.75
A-1	115.25	119.75
A	121.25	125.75
B	127.25	131.75
C	133.25	137.75
D	139.25	143.75
E	145.25	149.75
F	151.25	155.75
G	157.25	161.75
H	163.25	167.75
I	169.25	173
7	175.25	17[illegible]
8	181.25	18[illegible]
9	187.25	191[illegible]
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75
J	217.25	221.75
K	223.25	227.75
L	229.25	233.75
M	235.25	239.75
N	241.25	245.75
O	247.25	251.75
P	253.25	257.75
Q	259.25	263.75
R	265.25	269.75
S	271.25	275.75
T	277.25	281.75
U	283.25	287.75
V	289.25	293.75
W	295.25	299.75
14	471.25	475.75
15	477.25	481.75
16	483.25	487.75
17	489.25	493.75
18	495.25	499.75
19	501.25	505.75
20	507.25	511.75
21	513.25	517.75
22	519.25	523.75
23	525.25	529.75
24	531.25	535.75
25	537.25	541.75
26	543.25	547.75

CHANNEL	VIDEO CARRIER	SOUND CARRIER
27	549.25	553.75
28	555.25	559.75
29	561.25	565.75
30	567.25	571.75
31	573.25	577.75
32	579.25	583.75
33	585.25	589.75
34	591.25	595.75
35	597.25	601.75
36	603.25	607.75
37	609.25	613.75
38	615.25	619.75
39	621.25	625.75
40	627.25	631.75
41	633.25	637.75
42	639.25	643.75
43	645.25	649.75
44	651.25	655.75
45	657.25	661.75
46	663.25	667.75
47	669.25	673.75
48	675.25	679.75
49	681.25	685.75
50	687.25	691.75
51	693.25	697.75
52	699.25	703.75
53	705.25	709.75
54	711.25	715.75
55	717.25	721.75
56	723.25	727.75
57	729.25	733.75
58	735.25	739.75
59	741.25	745.75
60	747.25	751.75
61	753.25	757.75
62	759.25	763.75
63	765.25	769.75
64	771.25	775.75
65	777.25	781.75
66	783.25	787.75
67	789.25	793.75
68	795.25	799.75
69	801.25	805.75
70	807.25	811.75
71	813.25	817.75
72	819.25	823.75
73	825.25	829.75
74	831.25	835.75
75	837.25	841.75
76	843.25	847.75
77	849.25	853.75
78	855.25	859.75
79	861.25	865.75
80	867.25	871.75
81	873.25	877.75
82	879.25	883.75
83	885.25	889.75

M
S
C
COMMUNICATIONS, INC [illegible] GROVE, IND 317-787-9428

TESTING AND OPERATION HANDBOOK

SAM I & SAM II

Duplicate

T-K-3

MID STATE COMMUNICATIONS, INC. 174 S. FIRST AVE., BEECH GROVE, IND. 317-787-9426,

U.S. CABLE CHANNEL FREQUENCIES

CHANNEL	VIDEO CARRIER	SOUND CARRIER
T- 7	7.	[illegible]
T- 8	13	17.5
T- 9	19	23.5
T-10	25	29.5
T-11	31	35.5
T-12	37	41.5
T-13	43	47.5
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
A-2	109.25	113.75
A-1	115.25	119.75
A	121.25	125.75
B	127.25	131.75
C	133.25	137.75
D	139.25	143.75
E	145.25	149.75
F	151.25	155.75
G	157.25	161.75
H	163.25	167.75
I	169.25	173.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75
J	217.25	221.75
K	223.25	227.75
L	229.25	233.75
M	235.25	239.75
N	241.25	245.75
O	247.25	251.75
P	253.25	257.75
Q	259.25	263.75
R	265.25	269.75
S	271.25	275.75
T	277.25	281.75
U	283.25	287.75
V	289.25	293.75
W	295.25	299.75
14	471.25	475.75
15	477.25	481.75
16	483.25	487.75
17	489.25	493.75
18	495.25	499.75
19	501.25	505.75
20	507.25	511.75
21	513.25	517.75
22	519.25	523.75
23	525.25	529.75
24	531.25	535.75
25	537.25	541.75
26	543.25	547.75

CHANNEL	VIDEO CARRIER	SOUND CARRIER
27	549.25	553.75
28	555.25	559.75
29	561.25	565.75
30	567.25	571.75
31	573.25	577.75
32	579.25	583.75
33	585.25	589.75
34	591.25	595.75
35	597.25	601.75
36	603.25	607.75
37	609.25	613.75
38	615.25	619.75
39	621.25	625.75
40	627.25	631.75
41	633.25	637.75
42	639.25	643.75
43	645.25	649.75
44	651.25	655.75
45	657.25	661.75
46	663.25	667.75
47	669.25	673.75
48	675.25	679.75
49	681.25	685.75
50	687.25	691.75
51	693.25	697.75
52	699.25	703.75
53	705.25	709.75
54	711.25	715.75
55	717.25	721.75
56	723.25	727.75
57	729.25	733.75
58	735.25	739.75
59	741.25	745.75
60	747.25	751.75
61	753.25	757.75
62	759.25	763.75
63	765.25	769.75
64	771.25	775.75
65	777.25	781.75
66	783.25	787.75
67	789.25	793.75
68	795.25	799.75
69	801.25	805.75
70	807.25	811.75
71	813.25	817.75
72	819.25	823.75
73	825.25	829.75
74	831.25	835.75
75	837.25	841.75
76	843.25	847.75
77	849.25	853.75
78	855.25	859.75
79	861.25	865.75
80	867.25	871.75
81	873.25	877.75
82	879.25	883.75
83	885.25	889.75

MID STATE COMMUNICATIONS, INC. 174 S. FIRST AVE., BEECH GROVE, IND. 317-787-9426.

MP MASTER
MA33606